

WHAT IS CLAIMED IS:

1. A pattern inspection method which scans the inspected pattern formed on a substrate according to the design data with the laser beam and receives the light passing through said substrate with the light receiving device and, from the pattern information obtained by said light receiving device, generates the image of the inspected pattern and, for coincidence between this image and the reference data obtained by imaging of said design data, corrects said reference data to generate the reference image and compares the image of said inspected pattern and the reference image to detect any defects of the inspected pattern wherein
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- said reference image generation being executed by determination of the edge boundary condition showing the gray level corresponding to the pattern edge position through convolution operation of the optical point spread function corresponding to the laser beam strength and said inspected pattern image as well as detection according to said edge boundary condition of the edge position in said inspected pattern by the unit of sub-pixels.
2. A pattern inspection method which scans the inspected pattern formed on a substrate according to the design data with the laser beam and receives the light

passed through said substrate with the light receiving
5 device and, from the pattern information obtained by
said light receiving device, generates the image of the
inspected pattern and, for coincidence between this
image and the reference data obtained by imaging of said
design data, corrects said reference data to generate
10 the reference image and compares the image of said
inspected pattern and the reference image to detect any
defects of the inspected pattern wherein

said reference image generation comprising
provision to each pixel of sub-pixels dividing
15 the pixel to form a matrix and calculation of the gray
level of the pixel based on the number of sub-pixels
belonging to the pattern developed in each pixel and
calculation of the pattern width for said
inspected pattern and for the reference data at the
20 position at the corresponding position by treating the
number obtained by dividing said gray level by the gray
level step count as the width of the pattern developed
in that pixel.

3. A reference image preparation method as set forth
in Claim 2 wherein

the gray level of each pixel is calculated from
the number of sub-pixels belonging to said inspected
5 pattern and, treating the count obtained by dividing
this gray level by the gray level step count as the

pattern width of the inspected pattern developed in the pixel, the pattern width of said inspected pattern is calculated and

10 the gray level of each pixel is calculated from the number of sub-pixels belonging to said reference data pattern and, treating the count obtained by dividing this gray level by the gray level step count as the pattern width of the reference data developed in the
15 pixel, the pattern width of said reference data is calculated.

4. A reference image preparation method as set forth in Claim 3 wherein

 the pattern correction width of said reference data is calculated from the difference between the
5 pattern width of said inspected pattern and the pattern width of the reference data.

5. A pattern inspection device comprising:

 a scanning means which scans the inspected pattern formed on the substrate according to the design data with the laser beam and receives the light passing
5 through said substrate with the light receiving device,

 a photoelectric image processing means which generates the image of the inspected pattern from the pattern information obtained by the light receiving device in said scanning means,

10 a reference image generation means which
generates the reference image with correcting said
reference data so that the positions of the image of
said inspected pattern and the reference data obtained
by imaging of said design data coincide,

15 a comparison means which compares the image of
said inspected pattern and the reference image to detect
any defect in the inspected pattern, and

20 an edge position detection means which determines
the edge boundary condition showing the gray level
corresponding to the pattern edge position through
convolution operation of the optical point spread
function corresponding to the laser beam strength and
the image of said inspected pattern and detects the edge
position of the inspected pattern by the unit of sub-
25 pixels according to said edge boundary condition.

6. A pattern inspection device comprising:

5 a scanning means which scans the inspected
pattern formed on the substrate according to the design
data with the laser beam and receives the light passing
through said substrate with the light receiving device,

 a photoelectric image processing means which
generates the image of the inspected pattern from the
pattern information obtained by the light receiving
device in said scanning means,

10 a reference image generation means which

generates the reference image with correcting said reference data so that the positions of the image of said inspected pattern and the reference data obtained by imaging of said design data coincide,

15 a comparison means which compares the image of said inspected pattern and the reference image to detect any defect in the inspected pattern, and

20 a pattern width calculation means which provides each pixel with sub-pixels dividing the pixel into a matrix and calculates the gray level of each pixel based on the number of sub-pixels belonging to the pattern developed in each pixel and, with treating the count obtained by dividing this gray level by the gray level step count as the width of the pattern developed in the
25 pixel, calculates the pattern width of said inspected pattern and the pattern width of the reference data at the corresponding position respectively.

7. A pattern inspection device as set forth in Claim 6 wherein

 said pattern width calculation means
 calculates the gray level of each pixel from the
5 number of sub-pixels belonging to said inspected pattern and, with treating the count obtained by dividing this gray level by the gray level step count as the pattern width of the inspected pattern developed in the pixel, calculate the pattern width of said inspected pattern,

10 and also calculates the gray level of each pixel from
the number of sub-pixels belonging to the pattern of
said reference data and, with treating the count
obtained by dividing this gray level by the gray level
step count as the pattern width of the reference data
15 developed in the pixel, calculates the pattern width of
said reference data.

8. A pattern inspection device as set forth in Claim
7 wherein

said pattern width calculation means
calculates the pattern correction width of said
5 reference data from the difference between the pattern
width of said inspected pattern and the pattern width of
the reference data.

9. A computer readable memory storing a pattern
inspection program which, by controlling the computer,
scans the inspected pattern formed on the substrate
according to the design data with the laser beam and
5 receives the light passing through said substrate with
the light receiving device and generates the image of
the inspected pattern according to the pattern
information received by the light receiving device and,
for coincidence of this image and the reference data
10 position obtained by imaging of said design data,
corrects said reference data to generate the reference

image and compares the image of the inspected pattern and the reference image to detect any defect in the inspected pattern wherein

15 said pattern inspection program executes,
 in said reference image generation process,
 determination of the edge boundary condition
showing the gray level corresponding to the pattern edge
position by convolution operation of the optical point
20 spread function corresponding to the laser beam strength
 and the image of said inspected pattern and
 detection of the edge position of said inspected
pattern by the unit of sub-pixels according to said edge
boundary condition.

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10. A computer readable memory storing a pattern
inspection program which, by controlling the computer,
scans the inspected pattern formed on the substrate
according to the design data using the laser beam,
5 receives the light passing from said substrate with the
light receiving device, generates the image of the
inspected pattern based on the pattern information
obtained by the light receiving device and, for position
coincidence between this image and the reference data
10 obtained by imaging of said design data, corrects said
reference data and generates the reference image, and
compares the image of said inspected pattern and the
reference image to detect defects of the inspected

pattern wherein

15 said pattern inspection program executes,
 in said reference image generation,
 provision of sub-pixels dividing the pixel as a
matrix to each pixel and calculation of the gray level
for each pixel based on the number of sub-pixels
20 belonging to the pattern developed in each pixel an
 calculation of the pattern width of said
inspected pattern and the pattern width of the reference
data at the corresponding position respectively with
treating the count obtained by dividing said gray level
25 by the gray level step count as the width of the pattern
developed in the pixel.

11. A computer readable memory storing the pattern
inspection program as set forth in Claim 10 wherein
 said pattern inspection program
 calculates the gray level of each pixel from the
5 number of sub-pixels belonging to said inspected pattern
and, with treating the count obtained by dividing this
gray level by the gray level step count as the pattern
width of the inspected pattern developed in the pixel,
calculates the pattern width of said inspected pattern,
10 and also calculates the gray level of each pixel from
the number of sub-pixels belonging to the pattern of
said reference data and, with treating the count
obtained by dividing this gray level by the gray level

step count as the pattern width of the reference data
15 developed in the pixel, calculates the pattern width of
said reference data.

12. A computer readable memory storing the pattern
inspection program as set forth in Claim 11 wherein
said pattern inspection program
calculates the pattern correction width of said
5 reference data from the difference between the pattern
width of said inspected pattern and the pattern width of
the reference data.

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